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[Soderzhaniye litiya i toriya v zheltozemno-podzolistykh pochvakh]

Izvestiya Akademii Nauk Azerbaydzhanskoy SSR. Seriya biologicheskikh nauk [News of the Academy of Sciences of the Azerbaydzhan SSR. Biological Sciences Series]. No. 5-6, 1970, pp. 69-71.

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LITHIUM AND THORIUM CONTENT IN YELLOW PODZOLIC SOILS

Study of the content of trace elements in yellow soils has definite scientific interest. This interest stems from the peculiarities of the genetic development of these particular soils. It is known that the process involved in the formation of yellow soils is accompanied by a redistribution of the elementary component parts of the soil. Because yellow soils develop beneath forest vegetation, the occurrence of a superposition of podzolic soil formation on the yellow soil process is quite frequent. The combination of these processes determines a whole series of specific soil properties.

R. V. Kovalev, B. I. Gasanov, S. Faradzheva, and others, have provided details on the characteristics of yellow soils, the peculiarities of these soils, and their properties. But there has been little discussion in the scientific literature (A. N. Gyul'akhmedov, O. K. Mamedov, 1965) of questions concerned with the trace element composition of the republic's yellow soils.

This paper examines the lithium and thorium content, as well as questions concerned with the distribution of these elements through the soil profile, using as the example yellow podzolic soils with different degrees of podzolization. Colorimetry was used to determine the lithium and thorium. The reagents used were, for lithium, "thoron" in sodium stearate, and for thorium, "arsenazo III" in an acid medium. A calibration curve was used for the quantitative calculation. The magnitudes of element content were calculated in weight percents.

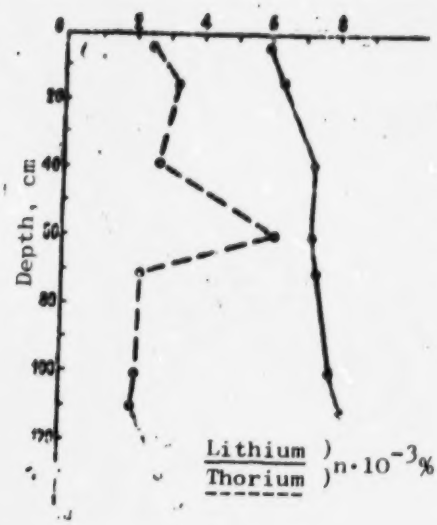

Figure 1. Yellow cryptopodzolic soils (r. No. 2).

The yellow cryptopodzolic soils shown in Figure 1 can be characterized as having a humus content of 7.0% to 1.0% in a meter layer of soil. The reaction of the medium varies from 5.5 to 4.4 (pH - KCl extract), depending on the morphological horizon of the soil. The lowest pH indices are at the 15-38 cm (4.4) and 38-59 cm (4.7) horizons, respectively. The soils are heavy to medium loamy in texture.

The content of the molecular form of lithium is quite high, ranging in value from 6.11 to $8.67 \cdot 10^{-3}$%.

As may be seen from Figure 1, the molecular form of lithium has a definite tendency to increase from the upper to the lower morphological horizons. Because lithium is one of the most mobile of the elements, heavy accumulations of lithium do not occur in the upper high-humus horizons under the conditions that prevail in the Lenkoran' subtropical zone. The phenomenon of some depletion in the molecular form of lithium in the upper horizons of soils, and the accumulation of lithium in the lower horizons, can be explained by the water balance in the subtropical zone.

It is of interest to point out that B. I. Gasanov (1957) observed this same phenomenon with respect to the content of potassium and sodium in yellow soils. The analogous nature of the migration of sodium, potassium, and lithium in soils shows a similarity to the characteristics of alkali earth metals (A. P. Venogradov, 1957).

Leaching of thorium from the upper horizon also can be observed. It must be pointed out that the assumption of the dissolving of thorium salts in atmospheric precipitation would be erroneous. It is a known fact that thorium is one of the elements that is virtually insoluble in aqueous solutions (V. I. Vernadskiy, 1934).

Leaching of thorium is, in our opinion, possible only with suspended minerals and organic soil particles. The slight increase in the thorium content in the next horizon can be explained by the appearance here of signs of the podzol formation process. The horizon at a depth of 68-59 cm also stands out in terms of thorium content, because here the quantity of thorium is $6.3 \cdot 10^{-3}$%. In this particular case, the substantial increase in thorium in his horizon is tied in with the illuvial processes.

V. I. Baranov (1963) explains the accumulation of radioelements, thorium in particular, in the illuvial horizons in terms of the role of the fine clay fraction, and of the fraction of the physical clay in the accumulation of these elements.

D. M. Grodzonskiy (1965) points out the increase he found in his studies in the content of thorium in the podzolic and illuvial horizons in various of the soils in the Ukraine.

Noted in the soils reviewed is a marked increase in thorium content in the 110-130 cm horizon, which can be characterized by a heavy admixture only slightly affected by the processes of soil formation from the parent

material. These soils can be classified as loamy-sandy loamy illuvium-proluvium. There is the view that thorium has a tendency to accumulate in rocks enriched with silicon oxide (D. K. Osipov and R. S. Zhuravlev, 1965). At the same time, a relatively uniform distribution of thorium in the soil profile that does not exceed one order of magnitude in its limits is characteristic of these soils.

Figure 2 shows yellow strongly-podzolized soils. The humus content in these soils changes from 2.6% to 0.6% in a meter layer, and the drop with depth is quite sharp. The soils are heavy to slightly loamy in texture.

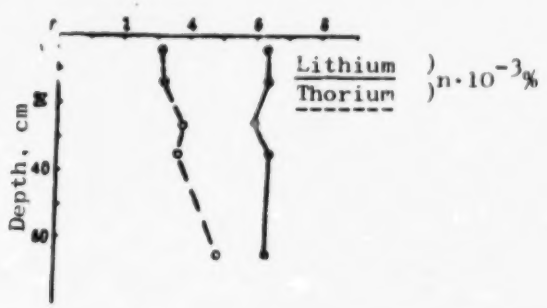

Figure 2. Yellow strongly-podzolized soils (r. No. 15).

The content of the molecular form of lithium in the upper horizon of these soils can be expressed by a magnitude of $6.3 \cdot 10^{-3}$%. There is a tendency to a greater leaching of lithium in the second horizon, where signs of podzolization are clearly apparent. Noted in the next horizon (26-35 cm) is some increase in the lithium content as compared to the podzolic horizon. In general, a quite uniform distribution of lithium with respect to morphological horizons is characteristic of the soils studied.

The obvious increase in thorium content in the illuvial horizon must be stressed ($4.9 \cdot 10^{-3}$%). This can be most efficiently studied in the upper humus of the horizon. The tendency to an increase in the thorium content

can already be seen in the podzolic horizon. The differences in the geochemical characteristics of elements such as lithium and thorium can be traced quite well by using these soils as an example. As may be seen from Figure 2, the more mobile lithium is leached out in the podzolization process, whereas the thorium has a tendency to sorption in the podzolic horizon. In the case of thorium, the accumulation in the illuvial horizon of the soils is the more clearly defined when compared to lithium.

The studies therefore show that yellow podzolic soils can be characterized as having a relatively high content of lithium, as well as of thorium, expressed in $n \cdot 10^{-3}$ weight %.

Most characteristic of lithium is the relative uniformity of the distribution of morphological horizons, with leaching in those horizons in which signs of podzolization processes appear. The thorium content, on the other hand, increases in the podzolic (to a lesser degree) and in the illuvial horizons.

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